Introduction to Digital Signal Processing (DSP)

Books

- S Poornachandra and B Sasikala, Digital Signal Processing, 3rd edition, Mc Graw Hill

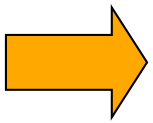
– J.G. Proakis and D.G. Manolakis, Digital Signal Processing 3rd edition, Prentice-Hall.
– R.G Lyons, Understanding Digital Signal processing, 2nd edition, , Prentice-Hall.

What is Digital Signal Processing?

Digital: operating by the use of discrete signals to represent data in the form of numbers

Signal: a parameter (electrical quantity or effect) that can be varied in such a way as to convey information

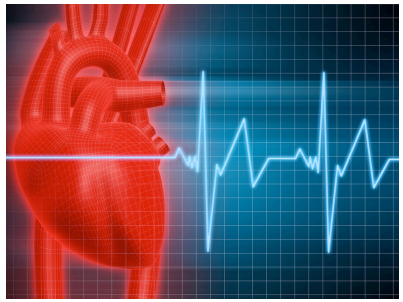
Processing: a series operations performed according to programmed instructions



changing or analysing information which is measured as discrete sequences of numbers

Applications of DSP - Biomedical

Biomedical: analysis of biomedical signals, diagnosis, patient monitoring, preventive health care, artificial organs



Examples:

1) electrocardiogram (ECG) signal – provides doctor with information about the condition of the patient's heart

2) electroencephalogram (EEG) signal – provides Information about the activity of the brain

Applications of DSP - Speech

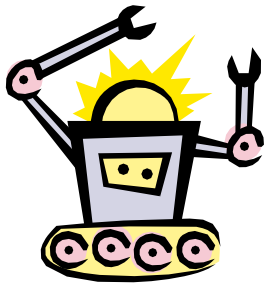
Speech applications:

Examples

1) noise reduction – reducing background noise
in the sequence produced by a sensing device (microphone)

2) speech recognition – differentiating between various speech sounds

3) synthesis of artificial speech – text to speech systems for blind



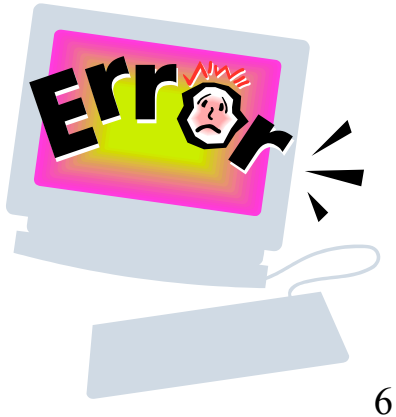
Applications of DSP - Communications

Communications:

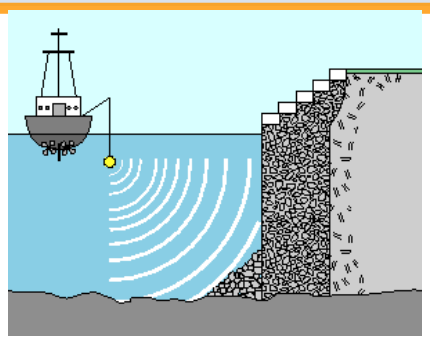
Examples

1) telephony – transmission of information in digital form via telephone lines, modem technology, mobile phones

2) encoding and decoding of the information sent over a physical channel (to optimise transmission or to detect or correct errors in transmission)

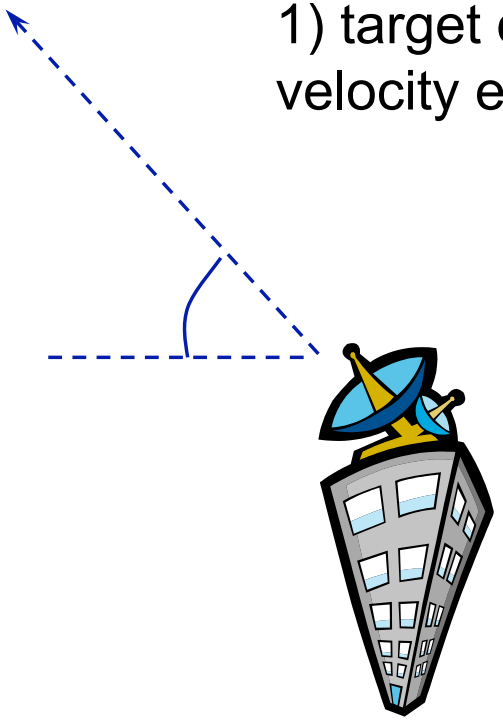


Applications of DSP - Radar



Radar and Sonar:

Examples



1) target detection – position and velocity estimation

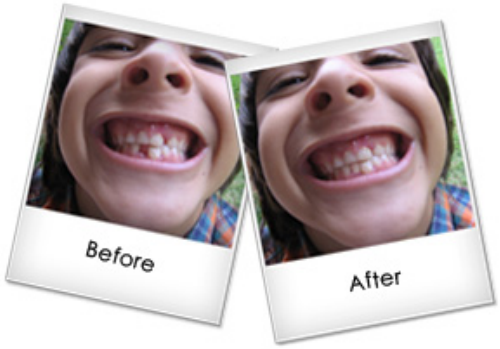
2) tracking

Applications of DSP – Image Processing

Image Processing:

Examples

1) content based image retrieval – browsing, searching and retrieving images from database

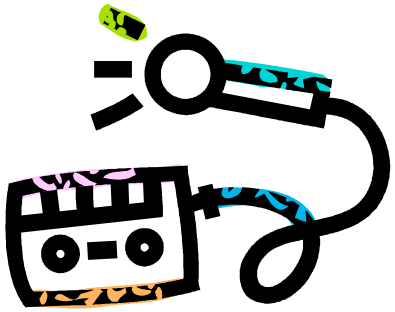


2) image enhancement

2) compression - reducing the redundancy in the image data to optimise transmission / storage

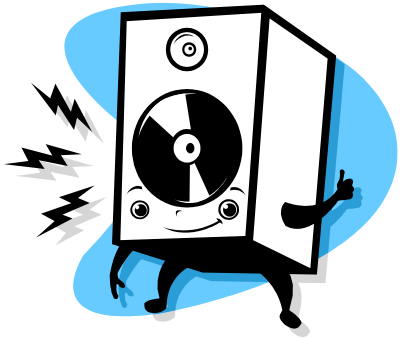
Applications of DSP – Music

Music Applications:



Examples:

1) Recording

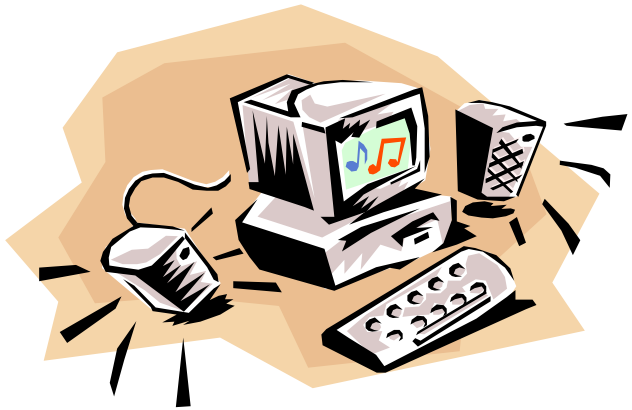


2) Playback

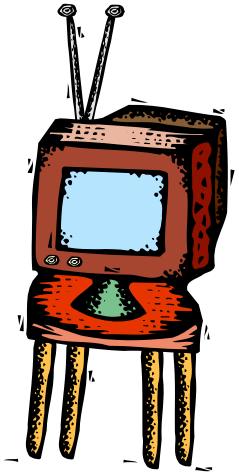
3) Manipulation (mixing, special effects)

Applications of DSP - Multimedia

Multimedia:

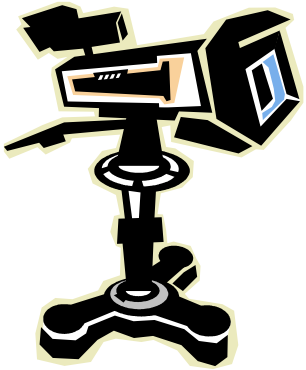


generation storage and transmission of sound, still images, motion pictures



Examples:

1) digital TV



2) video conferencing